

The Application of Financial Analysis System of Enterprise Core Competitiveness

—A Case Study of the Listed Company in Shanxi Province

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Abstract—According to the core, leading, coordinative and dynamic nature of the enterprise core competitiveness, a system that consists of four enterprise financial analysis indexes, namely, human capital return on investment, R&D and innovation capability, cash balance capacity and return rate on capital investment is set up. This paper attempted to test the reasonability and feasibility of the practical application of this system. Therefore, it made the empirical test on the five years' financial data of 35 listed companies in Shaanxi province, and found that the fitting effect of the four financial analysis indexes was good, and the explanatory degree of each indicator and the enterprise core competitiveness is 72.26%. As a consequence, it is viable to adopt the four indicators to reflect and explain enterprise core competitiveness.

Keywords—core competitiveness; financial analysis system; application

I. RESEARCH DESIGN OF FINANCIAL ANALYSIS INDEXES

A. Sample selection and data sources

There are 46 listed companies, most of which are engaged in manufacturing industry in Shanghai and Shenzhen stock exchanges. Among them, 35 companies are selected as the samples in this paper based on the construction and the application of financial analysis system of enterprise core competitiveness. Excluded are the ST Xinghua and ST Hongsheng which have been under the special treatment, 7 companies that have been listed for shorter than five years such as Chenxi Aviation, companies whose data are out of the standard such as Shanguotou A and Western Securities. The data of the 35 selected companies are mainly from the 2012 to 2016 annual reports which are extracted from the yearly disclosures of Shanghai Stock Exchange, Shenzhen Stock Exchange and eastmoney.com. All indexes were sorted out through the formula obtained from normative research. EViews8.0 was used for data statistics and analysis in the empirical test.

B. Research hypotheses

The four financial analysis indicators constructed before correspond respectively to the characteristics of the core competitiveness of enterprises. Before verifying the correlation, the following hypotheses are made in this paper.

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Hypothesis 1: the core competitiveness of enterprises is positively correlated with the return on investment of human capital [1]. As the core resource of an enterprise, human capital is a kind of local competitive advantage. Although it only accounts for a small part in the development of an enterprise, it serves as a powerful backup and can make the company invincible in fierce competition.

Hypothesis 2: there is a positive correlation between core competitiveness and R&D and innovation capability [2]. The R&D and innovation capability represents the independence ability of enterprises, which, to some extent, determines the degree of core competitiveness of enterprises. The greater the R&D and innovation capability, the harder it will be for the counterparts to imitate, and the enterprise will obtain a longer-lasting leadership.

Hypothesis 3: there is a positive correlation between core competitiveness and cash balance capability [3]. Cash balance refers to the coordination of internal superior resources of an enterprise. Good cash balance ability is manifested in the reasonable collocation of working capital and the sound resource integration, which provides capital guarantee for the smooth operation of the enterprise and thus laying the foundation for the core competitiveness of the enterprise.

Hypothesis 4: the core competitiveness of enterprises is positively correlated with the profit of capital investment [4]. To obtain profit is one of the important goals of enterprise operation and development. Therefore, the enterprise has invested a large amount of capital to ensure its efficient operation. In the dynamic change and development, enterprises reap income and consolidate their ability of sustainable development through the cycle of investment and profit. The more dynamic the enterprise is, the more sustainable the income from capital investment will be, and the higher its core competitiveness will be.

C. Variable description and model establishment

1) Definition of independent variable

Human capital investment rate of return(X_1): human capital investment rate of return = net income of human capital investment/cost of human capital = net profit/payment to employee

R&D and innovation ability(X_2): R&D and innovation ability=(development expenditure+intangible assets)/operating income

Cash balance capacity(X_3): cash balance capacity = working capital-working capital requirement (take the logarithm of the absolute value of the result)

Return rate on capital investment(X_4): return rate on capital investment = core profit/total invested capital = (operating income - operating cost - operating taxes and surcharges - administrative expenses - sales expenses - financial expenses)/(average balance of equity or paid-in capital + average balance of capital accumulation fund)

2) Definition of dependent variable

In the standard, stable and mature market economy trading environment, the market value of assets quantifies the investment value of enterprises. Similarly, the core competitiveness of enterprises changes dynamically with the fluctuation of the market value of enterprise assets. Using the asset to market capitalization ratio, it can reasonably reflect the core competitiveness of the enterprise without being influenced by the size of the company.

Asset to market capitalization ratio (Y): asset to market capitalization ratio = annual total market value of assets/total assets. The larger the index value is, the stronger the core competitiveness of the enterprise is. The market value of assets is the total value of stocks calculated by multiplying the market price of listed companies in the securities market by the total number of shares issued.

TABLE I. VARIABLE DESCRIPTION

Types	Variables	Calculation formula
Dependent variable	Asset to market capitalization ratio(Y)	annual total market value of assets/total assets
Independent variables	Human capital investment rate of return(X_1)	net profit/payment to employee
	R&D and innovation ability(X_2)	(development expenditure + intangible assets)/operating income
	Cash balance capacity(X_3)	working capital - working capital requirement
	Return rate on capital investment(X_4)	core profit/total invested capital

3) Model establishment

According to the above definition and the research purpose of this paper, combined with the requirements of regression model analysis, the model is established as follows:

$$Y_{it} = \alpha_i + b_1 X_{1it} + b_2 X_{2it} + b_3 X_{3it} + b_4 X_{4it} + \mu_{it}$$

Y represents the asset to market capitalization ratio; X_1 , X_2 , X_3 and X_4 respectively stand for the human capital investment rate of return, R&D and innovation ability, cash balance capacity and return rate on capital investment. b_1 , b_2 , b_3 and b_4 refer to the model parameters of four independent variables respectively. α is the constant term; μ is the stochastic disturbance. The subscript i is the cross-section number, representing different enterprises; the subscript t is the length of time, representing the five-year-period from 2012 to 2016.

II. THE EMPIRICAL TEST OF THE ANALYSIS INDEXES

A. Correlation analysis

The purpose of this research is to construct financial analysis indexes that can well reflect the core competitiveness of enterprises from the perspective of financial accounting, so as to show the status of the core competitiveness of enterprises. To a certain extent, the four main characteristics of core competitiveness are correlated, so the correlation between various variables can be accepted.

TABLE II. VARIABLES CORRELATED COEFFICIENTS (PEARSON CORRELATED)

	X_1	X_2	X_3	X_4
X_1	1			
X_2	-0.217	1		
X_3	0.136	0.006	1	
X_4	0.315	-0.143	0.099	1

*** represents those that are significantly correlated at the level of 0.01. ** denotes those that are significantly correlated at the level of 0.05.

B. Multiple regression analysis

The empirical analysis of this paper involves the data of 35 listed companies in Shaanxi province from 2012 to 2016. When making empirical analysis, we need to choose the right models at the beginning. First, the F test is used to determine to choose the mixed effects model or entity fixed effects model. Second, Hausman test determines whether to adopt the entity fixed effects model or the entity random effects model. In the empirical test, the maximum likelihood ratio test of F statistics was carried out through Eviews8.0 software. Then mixed effect model and individual fixed effect model regression were conducted on the sample data. Finally, choose the mixed effects model or individual fixed effects model according to the F value of the regression results.

1) Mixed effects model

TABLE III. THE GOODNESS OF FIT TEST OF MIXED REGRESSION MODEL

R-squared	0.146830	Mean dependent var	1.805755
Adjusted R-squared	0.131862	S.D. dependent var	1.628462
S.E. of regression	1.517302	Akaike info criterion	3.694336
Sum squared resid	393.6771	Schwarz criterion	3.766674
Log likelihood	-319.2544	Hannan-Quinn criter.	3.723679
Durbin-Watson stat	0.762343		

According to the regression results, R^2 equals 0.146830, and the adjusted R^2 equals 0.131862.

2) Entity fixed effects model

TABLE IV. THE GOODNESS OF FIT TEST OF ENTITY FIXED EFFECT MODEL

R-squared	0.722644	Mean dependent var	2.566050
Adjusted R-squared	0.645147	S.D. dependent var	1.412220
S.E. of regression	0.957838	Sum squared resid	124.7737
F-statistic	9.324855	Durbin-Watson stat	1.685437
Prob(F-statistic)	0.000000		

According to the regression results, R^2 equals 0.722644, and the adjusted R^2 equals 0.645147.

3) F-test

TABLE V. F TEST RESULT

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.718611	(34,136)	0.0000

It can be seen from the comparison between table 4 and table 5 that the goodness of fit of entity fixed effects model is higher than that of mixed effects model. As can be seen from table 6, the value of F is 8.718611, and P=0.0000 < 0.05, so we need to establish entity fixed effects model rather than the mixed effect model. Next, Hausman test is needed to further select the model and determine which is the most appropriate model.

4) Hausman test

TABLE VI. HAUSMAN TEST RESULTS

Test Summary	Chi-Sq.Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	48.229803	4	0.0000

According to the above value of the chi-sq statistic, the value of P is 0.0000 which is smaller than 0.05. Therefore, we should establish the entity fixed effect regression model, so the regression model established above is applicable.

5) Regression analysis results

This part is analyzed by EViews8.0, and the regression analysis results are as follows:

TABLE VII. REGRESSION RESULTS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.579830	0.911783	-0.635929	0.5259
?	0.000733	0.032357	0.022649	0.9820
?	0.346725	0.380624	0.910939	0.3639
?	0.117626	0.046211	2.545414	0.0120
?	0.192357	0.316909	0.606978	0.5449
Fixed Effects (Cross)				
1-C	3.239835			
2-C	-0.749715			
3-C	0.966328			
4-C	0.368235			
5-C	-1.293685			
6-C	-0.443434			
7-C	-1.223066			
8-C	-1.172702			
9-C	-1.366873			
10-C	-0.660003			
11-C	-0.954415			
12-C	-0.233830			
13-C	1.004521			
14-C	-1.033540			
15-C	0.737578			
16-C	-1.465450			
17-C	-0.574065			
18-C	-0.670329			
19-C	-1.072481			
20-C	-0.084442			
21-C	0.804536			
22-C	-0.267698			

23-C	0.572995			
24-C	5.869438			
25-C	-0.879543			
26-C	-0.702697			
27-C	0.052094			
28-C	0.274080			
29-C	-0.159161			
30-C	1.007813			
31-C	0.951726			
32-C	-0.107839			
33-C	-0.625818			
34-C	-0.325652			
35-C	0.217260			
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.722644	Mean dependent var	2.566050	
Adjusted R-squared	0.645147	S.D. dependent var	1.412220	
S.E. of regression	0.957838	Sum squared resid	124.7737	
F-statistic	9.324855	Durbin-Watson stat	1.685437	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.708634	Mean dependent var	1.805755	
Sum squared resid	134.4446	Durbin-Watson stat	1.459592	

The data listed as coefficients are the regression coefficients of the model constructed in this paper. By substituting the regression coefficients and constant terms into the regression model, the following regression equation can be obtained:

$$Y = -579830 + 0.0007333 X_1 + 0.346725 X_2 + 0.117626 X_3 + 0.192357 X_4$$

C. Core competitiveness ranking of the 35 companies

This paper uses the human capital investment rate of return, R&D and innovation ability, the cash balance ability and return rate on capital investment as independent variables to reflect four basic characteristics of enterprise core competitiveness, and leverage asset to market value ratio as the dependent variable to quantitative reflect enterprise's core competitiveness. In Table 8 according to the value of assets ratio, the 35 listed companies' core competitiveness is ranked by average index value of the five year from 2012 to 2016. The greater the value is, the enterprise core competitiveness level is higher. The average values of the four basic financial indicators are listed in turn.

TABLE VIII. RANKING OF CORE COMPETITIVENESS (2012-2016)

Ran king	Company	Asset to market capitalization ratio (average)	Human capital investment rate of return (average)	R&D and innovation ability(average)	Cash balance capacity(average)	Return rate on capital investment(average)
1	Ligeance Aerospace	8.030104	4.102374	1.206419	19.538444	0.108971
2	Baoguang	4.701544	0.185205	0.003522	17.166472	0.108938
3	Fenghuodianzi	2.720865	0.217936	0.066484	19.455556	0.117865
4	Broadcom shares	2.704329	0.111277	0.282307	18.495959	0.031523
5	Xi'an Tousiam	2.671104	0.087953	0.086670	18.890012	-0.046550
6	Xi'an Yinshi	2.587755	0.022870	0.065353	18.668101	-0.013910
7	Dagang	2.567750	1.954385	0.048323	20.174587	0.097499
8	Jinhua	2.463363	0.710171	0.087556	18.661888	0.065768
9	Caissa Tourism	2.304849	0.336238	0.048850	19.234677	0.166345
10	Astropulsion	2.194449	0.415344	0.088557	20.126176	0.039866
11	Zhongzaizihuan	2.109642	0.020845	0.222402	19.696163	0.407055
12	Shaanxi Jinye	2.028266	0.513519	0.228410	18.892028	0.167640
13	Jinmu	1.810158	0.303708	0.159147	22.078861	0.027192
14	AVIC ZEMIC	1.686177	0.423154	0.096646	19.671101	0.136149
15	Qujiang Cultural Tourism	1.674383	0.259983	0.154125	18.080147	0.113285
16	Tong Petrotech Inc	1.601552	0.378830	0.047142	19.729044	0.016990
17	Typical	1.538627	-0.027409	0.148767	19.663076	-0.063254
18	Zhaonghuanzhuangbei	1.457385	0.254570	0.188473	19.438421	0.056478
19	Shaanxigas	1.364431	1.902264	0.050688	19.689430	0.274145
20	Jianshejixie	1.298059	-0.486002	0.052677	16.562404	-0.019495
21	AECCAERO ENGINE	1.295433	0.213691	0.080295	20.865716	0.097368
22	Zonghang Airplane	1.251715	0.087446	0.026979	21.042418	0.036341
23	Guoji Yixue	1.169015	0.721578	0.092537	19.909782	0.232116
24	Guangdian	1.131510	0.237473	0.032600	19.121753	0.128455
25	Baoti	1.076119	-0.060201	0.054179	20.279950	0.007636
26	Longji	1.026068	0.760483	0.042693	20.754480	0.149778
27	Caihong	0.931718	-5.050036	0.518550	20.257026	-0.071543
28	Baode	0.879863	0.831458	0.261954	19.667999	0.047830
29	Qinchuan	0.841792	-0.113104	0.091844	17.948867	-0.097214
30	Shaangu	0.823337	1.053449	0.042845	22.484726	0.189396
31	China Xidian	0.798622	0.354634	0.134090	22.883695	0.035614
32	Jianruiwoneng	0.693664	0.379770	0.225318	19.198651	0.048391
33	Yanchanghuajian	0.680674	0.338282	0.014742	20.224774	0.254130
34	Western metal material	0.599252	0.052896	0.177059	19.993492	-0.057394
35	CCOOP Group	0.487843	0.271371	0.069560	21.242345	0.052766

III. CONCLUSION

1. Goodness-Of-Fit. That the determination coefficient in the regression results is 0.722644 indicates that the model fits well. In the goodness of fit test, the four independent variables set in the formula can explain 72.26% of the variation of dependent variables, indicating that the model has a good degree of fitting. Therefore, these four financial analysis indicators can be used to reflect and explain the core competitiveness of enterprises.

2. Regression coefficient. It can be seen from the Table 7 that the symbols of the regression coefficients of the four independent variables are consistent with the actual economic significance, which proves the four hypotheses above. Moreover, the regression results of human capital investment return rate, R&D and innovation ability and return rate on capital investment are not very significant, indicating that the impact of the three indicators on enterprises may need a long time to take effect, or there may be a certain lag, thus being

unable to quickly reflect the core competitiveness of the enterprise. Indicators are also affected by many factors. Taking the human capital investment rate of return as an example, the return on human capital investment is also subject to factors such as the amount of enterprise investment, employees' skills and the value improvement.

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